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THE SEARCH FOR HEALTH

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Understanding Pain

As scientists have long known, there is good pain and bad pain.

Good pain serves a useful purpose. An ankle that hurts, for example, may alert a jogger to the possibility of a sprain. Or a patient complaining of an ache in the lower right abdomen can lead a doctor to make a life-saving diagnosis of appendicitis. In these cases the pain comes and goes with proper medical attention and the patient soon returns to a normal healthy state.

But for an estimated 40 million Americans, pain is a constant part of daily life. Nerve injuries, shingles or cancer are just some of the conditions that can produce pain so chronic that people are unable to lead normal productive lives. As basic scientists learn more about how pain signals travel through the body and how we can block pain through internal mechanisms, clinical researchers are able to apply their findings to help chronic pain patients.

Neuroscientists now are able to trace the intricate pathways that pain messages follow from an injured area up to the brain. The transfer of pain signals begins with specialized nerve endings, called nociceptors, contained in skin, muscle, and internal organs of the body. Nociceptors are sensitive to the various types of painful sensations that can occur. Nociceptors respond to several types of stimulation, such as a sharp blow, a drop of acid, or intense heat. Others are more selective and respond to a pinprick while ignoring painful heat or chemical stimulation. Nociceptors give information about the intensity of the pain and its location on the body surface.

While pain signals move quickly up to the brain, other activities happen back at the site of the injury. Chemical are secreted around the hurt finger that result in inflammation. Hormonal substances called prostaglandins play an especially important role in the pain, heat, redness, and swelling that occur following an injury.

Interestingly, scientists now know why the proverbial "take two aspirin and call me in the morning" is such an effective prescription for countless aches and pains. Not only does aspirin block the formation of prostaglandins, thus reducing inflammation and pain, but inhibition of prostaglandins also decreases pain caused by other chemicals released following tissue injury.

Over the last decade, pain research has focused on the body's internal methods of blocking pain messages. Just as we have distinct pathways that allow pain signals to reach the brain, we also have pathways descending from the brain that allow these signals to be modified or even totally blocked. Researchers have now isolated neurochemicals in the brain and spinal cord that operate in the descending pathways as pain-blocking agents. Called enkephalins, endorphins, and dynorphins, these families of opiate-like compounds occur naturally in our bodies.

For 2,000 years, drugs of the opiate family have been the most effective pain-relievers known to man. Opiate drugs are made from the juice of the poppy and have been used to treat ailments ranging from pain to shortness of breath, to congestive heart failure. Scientists now have shown that the naturally-occurring endorphins and enkephalins work on the same receptor sites in the brain as opiate drugs like morphine. When morphine is injected into the bloodstream, it mimics the effects of these naturally-occurring compounds.

Opiate drugs work differently than aspirin, however. Aspirin blocks pain directly at the site of a hurt. Opiate drugs block pain signals that have already entered the central nervous system by preventing the transfer of pain signals from the dorsal horn to the thalamus.

Researchers now are using what they know about the body's pain-suppressing mechanisms to develop drugs that work only on specific pain pathways without causing side effects. Prolonged use of an opiate drug often requires periodic increases in dosage to keep patients pain-free. Eventually, patients may reach a point where the drug is no longer effective. Besides developing new drugs targeted only at specific pain pathways, scientists are developing drugs that work on different receptors in the brain, other than those sensitive to opiate drugs. If successful, these new drugs could be used to relieve pain when tolerance becomes a problem.

The intense study of pain pathways in the body and the search for natural pain-suppressing chemicals offer future promise for chronic pain sufferers and those who experience pain in the brief collision of thumb and hammer. Someday, we may learn how to turn on pain-suppressing systems at will and harness our innate ability to block pain.

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